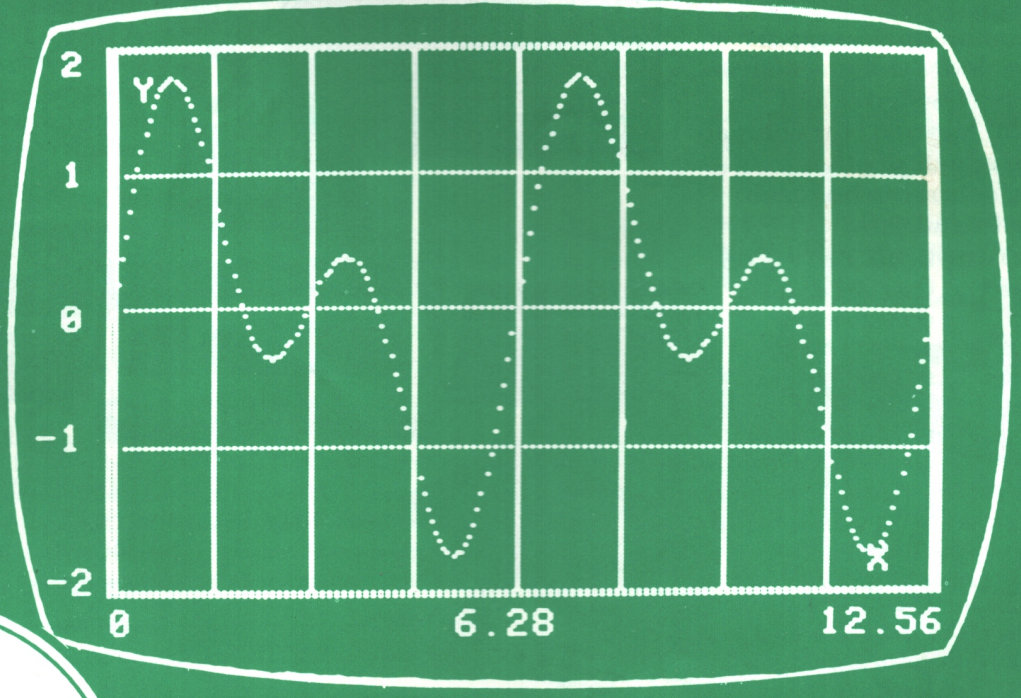
PRINTOUT

INSIDE NEWS on the PET

The Pet Users Magazine



NEW Regular Greg Yob Feature

Programming Hints & Tips

Disk Drive Destruction Test

Software Review

High Resolution Graphics for your PET

May 1980 95p

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Kit Spencer
General Manager
of Commodore Systems
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The Commodore PET is Britain's best selling micro-computer, with over 18,000 already installed in a wide range of fields, including Education, Business, Science and Industry.

This has led to a tremendous demand for high quality software.

And Commodore has met this demand by producing a first class range of programs, now available from the nation-wide network of Commodore Dealers.

Commodore's support also includes training courses, a Users' Newsletter and Official Approv[illegible] for compatible products of other manufacturers who reach agreed standards.

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Commodore's Floppy Disk Unit and high-speed Printer, combine with PET to form a complete system (ideal for running a business) for under £2,500.

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Over 50 Petpacks of programs are available (mainly on cassette) from Commodore Dealers. These cover such popular titles as Strathclyde Tutorial, Statistics pack 1, Assembler Development System, Stock Market Trends and the Treasure Trove Collection of game packs. Plus the new Arcade Supergame Series including "*INVADERS*"—quick to learn but difficult to master and already a No 1 favourite. Prices range from £5-£50.

TRAINING COURSES AND SEMINARS

PET systems are simple to use and any normal advice or assistance you may need can be obtained from Commodore Dealers.

On the other hand, for rapid training on a basic or advanced level, you will certainly be interested in Commodore's intensive 2- and 3-day residential courses. We also run one day general appreciation seminars.

PET USERS' NEWSLETTER

This is Commodore's official method of sharing new information and ideas between the many thousands of PET users. The newsletter is published regularly and for an annual subscription of £10 you can start receiving copies now.

Look out for this sign. It tells you that compatible products of other manufacturers have met with our standards of approval.

(Tick the appropriate boxes)

To: Commodore Information Centre, 360 Euston Road, London NW1 3BL. 01-388 5702

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PRINTOUT

Vol. 1, No. 5, May 1980

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Richard Pawson
Art Editor:
Michael Lawson-Foster
Staff Writer:
Nigel West
Advertising:
Wendy Cheetham
Correspondents:
Thomas Turnbull (Technical)
Terry Laudereau (U.S.A. East Coast)
Gregory Yob (U.S.A. West Coast)
Contributing Editors:
Gavin Sanders
Robin Bradbeer
Publisher
Jessica Allason

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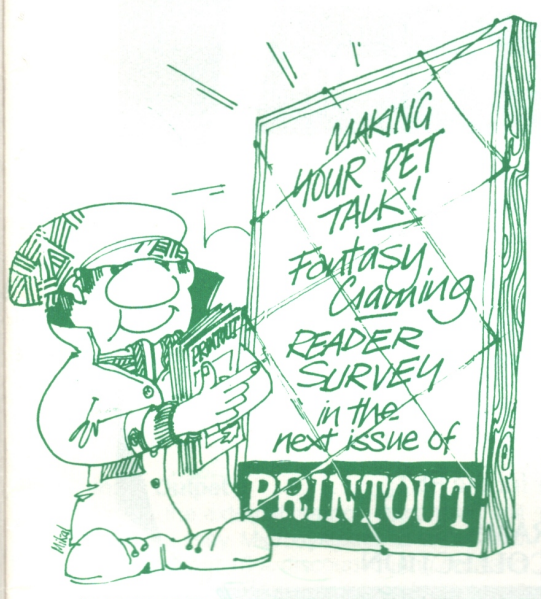

EDITORIAL

PRINTOUT, like the PET itself, is a fully interactive system. We collect information from manufacturers, programmers and users, then distribute it to our readers in the form of well-written articles for the novice and experienced hacker alike. We actively encourage feedback – in the form of our Read/Write column. What is less widely appreciated is that we pass many of your comments back to the suppliers concerned in collective form. These comments are beginning to take effect.

One of the reviews contained in this issue is the Kingston Computers Hardware Repeat Key. After sending us a review copy, Kingston phoned to ask what we thought of their product. Our reply was that we liked it, and thought it good value for money, but that the repeat timings (always a matter of personal opinion) were not ideal. Three days later, John Chew of that company announced that, following PRINTOUT's comments, the design was being changed (incorporating two mini-potentiometers) to allow each user to adjust the timing to his own preference.

That is what we call a responsible attitude – and it also demonstrates how well PRINTOUT is established. We are not just the most authoritative voice on PET in the field, but are becoming the body most representative of PET users in general. More dealers are now sending us their equipment for comment before going to market – so it pays to write to us if you have any strong opinions on past products.

Also in this issue is the first of our reprints of Gregory Yob's column – Personal Electronic Transactions – from the Stateside magazine *Creative Computing*. These are probably the finest and best researched articles on programming the PET in any publication. This month the subject is screen formatting – covered in great detail, but comprehensible to anyone with a simple knowledge of BASIC.

We are very much aware that our responsibility when dealing with a controversial subject is to supply concise arguments, not to make your mind up for you. We are thus trying wherever possible to provide two articles on many subjects. For example, our feature on high-density graphics consists of a thorough PRINTOUT review, followed by a user report, comparing the board with a Tektronix Graphics Computer.

We are now entering a new phase in the PET market – one where the existing users hold more power than ever before. PRINTOUT will be endeavouring to ensure that this power is used responsibly, and to good effect.

RICHARD PAWSON – Editor

Our belated apologies to Mrs Janak Gandhi for the accidental omission of her name as co-author of the article – 'Speech Synthesis on a PET' – in Issue 3 of PRINTOUT.

STOP PRESS

Low Cost British Speech Synthesiser for PET

A new synthetic speech system is under development at HB Computers of Kettering.

Words spoken by the user into a microphone are converted into digital form and stored on disk. When recalled by typing onto the screen, the sound generated by the synthesiser closely resembles the accent and pronunciation of the user.

The vocabulary of the prototype system is 80 words at present. It is anticipated that capacity can be raised to 600 plus words online using the ACT 800K disk drive.

It is projected that the system will be available from Petsoft by the autumn, priced below £150 inclusive of microphone and synthesiser.

Further details in the next issue.

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HOTLINE – News & Products

MAP Course

The North London Polytechnic is holding a series of 2-day courses on the 650X range of microcomputer components. These will be of particular interest to both Industrial and Hobbyist users of PETs who want to become fluent in Machine Code and Interfacing – fast.

Lasting from 10.00am to 9.00pm on both days, these courses are definitely not for the faint-hearted. Workshop laboratory sessions (using KIM1s) follow lectures by qualified persons including Robin Bradbeer whose 'unbiased' opinion is that these are the most comprehensive courses of their kind.

The syllabus includes: Hardware architecture, principles of Machine Code, Assembly Language, and Applications. It is a pity that no PETs are actually used (PRINTOUT reckons that KIM1s are used because you can 'see the Microchips in action') but processor used is identical.

Cost is £75 for the two days, or £95 for the residential ones to be held in July. More details can be obtained from the Secretary: Dept. of Electronic and Communication Engineering, Polytechnic of North London, Holloway Road, London N7 8DB.

There's no business like show business . . .

Commodore have now announced the official date and venue for the first ever PET Show, as 13th and 14th July in the Cafe Royal, Picadilly, London.

Software, Hardware and Applications demonstrations will take up over 50 stands, and the organisers are heralding the event as the first national get-together of User Clubs, special interest groups, and suppliers.

Well worth a visit – and look out for PRINTOUT.

Inpet Outpet

Petite, the external memory expansion unit from Plessey Microsystems, is to be sold with a further 10% discount during April and May. 32K of RAM can thus be added (cased and with its own power supply) for £300 including VAT.

The add-in equivalent called 'Inpet' is also reduced to £257.60.

A full technical specification is available from: Plessey Microsystems, Water Lane, Towcester. Tel: (0327) 50312.

Data Management System

A DMS capable of handling up to 5000 items on a single floppy disk is currently being marketed by CompSoft Ltd. of Old Manor Lane, Chilworth, Guildford, Surrey.

The user can access files using standard search criteria (Greater than, Less than, Equal to, etc.) as well as string functions, on up to four files.

New files can be inserted or adapted from existing ones – allowing selective printouts from files for passing on to another user. Numeric fields can be summed over all files to give, for example, the total value of goods in a stock control application.

Data-Base management, though well-established in the mainframe business is a relative newcomer to Micro's. PRINTOUT will be covering the existing programs in detail, shortly. More information on CompSoft's product can be obtained on 0483 39665.

PET Enhancement Package

PET users are advised to watch out for an exciting new piece of software called PEP, by its author Mike Todd of 27 Nursery Gardens, Lodgefield, Welwyn Garden City.

The PET Enhancement Package provides additional commands to PET Basic, for incorporation into working programs – not just as development aids. The twenty commands include: Computed GOTO & GOSUB, Double Density Plot, Degree/Radian conversion, and a single command to 'lower the top of BASIC'.

PRINTOUT awards Mr. Todd the Entrepreneur of the Year Award, for his 'making available' copies of the package for £25 to dealers and other interested parties. This will be until he decides which Software House through which to market it.

The specification looks excellent; now all we have to do is guess the future supplier.

PETPLAN

Someone out there is paying attention. In our first two issues we lambasted several inadequately documented and inexpertly executed pieces of software. Since then we have had cause to comment favourably on the Petaid system from Stage One Computers and Commodore's COMWORD W.P. package. Now it's Petsoft's turn for a bouquet; their new PET collection catalogue contains several very interesting packages including VisiCalc £125 and the PETPLAN Business Simulation £60. The latter is a development of a well established mainframe program simulating a medium sized manufacturing company. One or more players acting as a board of directors take decisions relating to manufacture, marketing and investment. Balance sheets and various production and sales reports are generated by the system. To complicate matters 20% of the workers and 10% of the sales force up and go each quarter. PETPLAN costs £60 and in addition to the program includes an audio voice guide on cassette and a 50 page manual. 32K RAM is required. Available from Petsoft and many dealers.

VisiCalc

Originally developed by Personal Software for the Apple and now available on the PET, VisiCalc's arrival in the UK was preceded by a considerable reputation. The program is intended to convert PET into a problem solving device capable of handling sophisticated business and scientific calculations of the 'What if' variety. American reviewers have gone overboard, one well-known journal describing it as "the best piece of micro software yet published".

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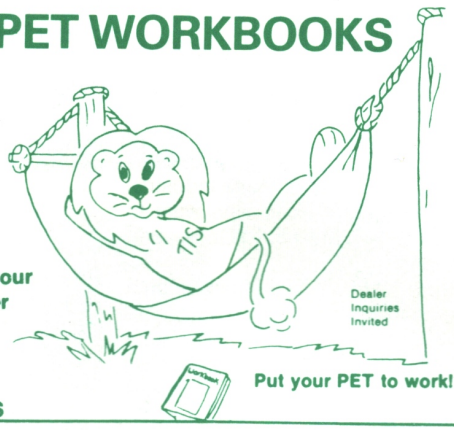

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DELETE	Removes groups of BASIC program lines
FIND	Locates and displays the BASIC program lines that contain a specified string
APPEND	Adds a previously SAVEd program to the one currently in your PET
DUMP	Displays the names and values of all the variables used by your program (excluding arrays)
HELP	If your program stops due to an error, HELP displays the offending line and where the PET detected the error.
TRACE	As a program runs, the last six line numbers being executed are shown in the upper right corner of the PET's screen.
STEP	Executes one BASIC line and stops. Pressing SHIFT executes the next line. The line number is displayed in the upper right corner of the screen
OFF	Turns TRACE or STEP off

For the new 16K and 32K PETS, the tool kit consists of a single ROM chip which plugs into the left most empty socket inside the PET. Price £55 plus VAT.
For 8K and other 'old ROM' PETs a small printed circuit board is attached to the memory expansion and 2nd cassette ports of the PET. Price £75 plus VAT. Also available for 8K PETS with new ROMS. Please state configuration when ordering.

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READ/WRITE

Your Questions Answered

How it does it

I have had my PET for about eighteen months now and at last your magazine seems about to assist me in sorting out 'how it does it'. I am currently using TIM 1.5 to disassemble BASIC – not an easy task because of all the subroutine calls and jumps – and the articles in Issues 2 and 3 have helped considerably. Keep it up!

P. H. Nash, Merseyside

As you will have found out, the big problem with disassembling machine code is that the interpretation is 'context sensitive'. Machine code instructions can be one, two or three bytes long, with the same numbers representing both the op-codes and the operands. Starting the disassembly at an arbitrary point can lead to meaningless drivel. To avoid this happening to you, it is well worth consulting a list of subroutine entry points, such as in "The PET Revealed" by Nick Hampshire. Good luck!

* * * *

Greener Still

I have a green screen PET and I wonder if I would get a worthwhile increase in screen contrast if I were to fit one of the green perspex screens claimed to make a black and white PET into a green model. After all you hardly ever see a green oscilloscope without a filter fitted?

K. Williams, Rhyl, Clwyd

The main purpose of the add-on green perspex screens is, as you say, to convert the black and white screen, and hence reduce eye strain. It does also have the effect of making the background completely black so you may find an increase in contrast even on a green phosphor-screen PET. However, as PET has a high contrast screen anyway, this is not essential unless it lives in a brightly lit area.

* * * *

And, Or, Not necessarily

Can you explain the use of the operators AND, OR, and NOT, in Boolean Algebra, particularly in relation to the screen print routine by Paul Hickinbotham in Volume 2, Issue 3 of the PUCN?

I cannot begin to understand the explanation given in the PET Handbook.

In the year or so that we have had our PET, I have managed to grasp a good working knowledge of BASIC, but what is Boolean Algebra? Or for that matter, what is a BIT?

R. M. Rennoldson, Boston, Lincs.

It is best to take these points in reverse order.

A Bit (short for Binary Digit) is the smallest variable possible. It can only have two states – '0' (sometimes referred to as Off, Low or False), or '1' (corresponding to On, High or True depending on the situation). By combining these Bits into groups (a nibble is simply a group of 4 bits, and a byte is a group of 8) we can represent numbers in Binary, or codes for characters.

Binary numbers are in base 2 so that the digits represent increasing powers of 2, not 10 as in normal decimal numbers. Thus, the binary number 1101 represents the number thirteen as follows:

1101=(1×8)+(1×4)+(0×2)+(1×1)=13
Binary

The algebra associated with the manipulation of Bits and Binary numbers is named after George Boole, who developed in the middle of the last century the concepts which are still fundamental to computer design.

As well as the normal four arithmetic functions, one can apply special Boolean functions including AND, OR and NOT. NOT simply changes all 0's in a binary number to 1's and vice versa. The other two use two arguments and are defined using 'Truth tables' as follows:

C=A OR B
Thus C is 1 if either A OR B are at 1

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

C=A or B
Thus c is 1 if either A OR B are at 1

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

These operations are used all the time in machine code, but it is both useful and unusual to have them available in BASIC. It is important to remember that these functions work on the binary representations of the numbers involved.

To illustrate this, try the example:

PRINT 13 AND 7

The binary representations are 13: 1101
and 7: 0111

'ANDing' each pair of bits together in turn gives:

```
1 1 0 1
0 1 1 1
-------
0 1 0 1
```

which is the binary representation of 5 and is what the above BASIC statement produces.

How is this used? In converting from the Peek/Poke codes used on PET's screen to the ASCII codes required by the printer, it is necessary to test and change various individual bits in the 8-bit codes. For example, ANDing with 128 will tell us if the most significant bit (No. 7) is 1 or, and ORing with 64 will ensure that bit No. 6 is at 1.

I hope that this hasty explanation is of some help; many PET users are unclear on this subject. For further details, there are plenty of beginners books on Boolean Algebra.

* * * *

Geere v. Sanders (Episode 4)

Aha, can I see Gavin's gauntlet on the floor (or is it just a 'token' gesture?). In brief, tokens are used by the BASIC interpreter because they have a number of advantages over the full expression. When PET examines a line of BASIC, tokens are readily identified because, being represented by a single value greater than 127, it is only necessary to test the most significant bit (MSB) in the search. There are exceptions, arising from lines which include quotes and REMark statements, but two flags are used (addresses 9 and 205 – 96 and 234 old ROMs) to allow for this. When a token is detected the value is used as an index, or pointer in a look-up table of addresses to the routine required to handle that function.

So much for PET's use of the function, what about you and I? Use of PET's tokens is limited only by the imagination, as they say (hence my dark silence!). Suppose we wish to write a renumbering program. One would search through the program using machine code to look for the tokens for GOTO, GOSUB and THEN. In the better renumberers we search also for 'GO' and 'RUN'. We ignore these words when they are in PRINT or REMark statements, because they are not then stored as tokens, but as ASCII strings. Not very inventive, it's the conventional technique.

Now how about a program that re-writes itself! Suppose you have a routine that must be entered or loaded only once, even though the program may need to be re-RUN several times. You may have a simple PRINT statement unavoidably in a loop which must only execute first time round, or the program may LOAD a machine code routine which need only to be loaded once. The trick is to POKE the address of the token (which you will have to find) after its use to 143. This will convert it to REM, and what follows on that line will be ignored until the main program is re-loaded.

Now about that simple peripheral. How about a connector to intercept the cassette connection and provide an LED to indicate when the motor is on. It comprises the connector, a socket, one resistor and one LED. Without the cassette, the LED could be flashed to indicate to the lady of the house that it's coffee time – a truly useful gadget!

Ron Geere, IPUG Editor

Your turn, Gavin (see Pets & Pieces).

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Personal Electronic Transactions

by Gregory Yob

A Quickie for You

Some of you know of a programming language called APL. In APL, programs can be written very precisely — and among APL programmers there is the "One-Line Program Syndrome." One programmer will write a line of heiroglyphics and hand this to another programmer, along with the statement: "Guess what **this** does!"

The PET permits some interesting short programs in BASIC, and if you come up with something interesting, and shorter than 10 lines, send it in. Dan Rubis sent me a 3-liner that can be of some use:

```
10 DIMA$(16):FORI=1TO16:READA$(I):NEXT
20 INPUTH$:C=0:FORI=1TO4:FORJ=1TO16:IF
   MID$(H$,I,1)=A$(J)THENC=C+(16↑(4-I))*(J-1)
30 NEXTJ:NEXTI:PRINTC:GOTO20:DATA 0,1,2,3,4,5,6,
   7,8,9,A,B,C,D,E,F
```

This critter asks for a 4 digit hexadecimal number and prints the decimal result. For example:

```
RUN
? 1000
 4096
? FFFF
 65535
```

That's fine — and Dan cautioned me that this program likes 4 digit entries. If you try entering just "1", you get 4096 back! A little bit of fiddling makes everything well, however:

```
10 G=16:DIMA$(G):FORI=1TOG:READA$(I):NEXT
20 INPUTH$:FORI=1TOLEN(H$):FORJ=1TOG:IFMID$
     (H$,I,1)=A$(J)THENC=C*G+J-1
30 NEXTJ,I:PRINTC:C=0:GOTO20:DATA 0,1,2,3,4,
     5,6,7,8,9,A,B,C,D,E,F
```

Fool with this one for a while — it is much more tolerant of input errors! (And runs a shade faster too.) Here are the tricks I used:

1) I converted the value 16 into the variable G — this was mostly to save some room in Line 20 which was getting a bit crowded!

2) The FOR I loop was changed to look at all of the characters in H$ — and if H$ was short, the I loop would only look that far.

3) When a hexadecimal digit was found, just multiply the current value by 16, and add the new digit — which is simpler than the first method, **and** permits the ignorance of "junk" characters without increasing the value of C.

4) For the sake of room, I used the NEXT J, I form, and moved the C=0 to Line 30 to make more space in Line 20.

If your entry is not the best BASIC code in the world, don't worry! I am interested in the **ideas** within a program, and cleaning-up of code is part of my meticulous nature. I do so to share the "tricks of the trade" with you, and to teach programming methods in an unobtrusive manner.

The next project is to do the reverse feat of converting a decimal number to hexadecimal. My result is:

```
10 H$="0123456789ABCDEF":GOTO30
20 P=INT(D/16):Q=D-16*P:A$=MID$(H$,Q+1,1)
     +A$:IF P>0THEND=P:GOTO20
30 PRINTA$:INPUTD:A$="":GOTO20
```

Line 20 computes Q to be the remainder after dividing D by 16. The correct character is added to A$, which is built left-to-right. When this is finished, the result is in A$ for your viewing.

A Formatting Program

Let's take the bull by the horns and try to make a reasonably useful subroutine for formatting numbers. A completely flexible routine would take too much space — but a simplified version will illustrate what has to be done. (If any of you elaborate on this routine, send me a copy!)

The steps to a formatting program are:

1) Decide on how to specify the desired format. The various versions of "PRINT USING" are a guide for this.

2) Conver the number that is to be printed into a string. (That's easy. Use STR$.)

3) Convert the number's representation into fixed point format. (If the PET served up 8.12E-04, convert this to .000812).

4) Check the format specification to match up the decimal point's location, and then remove any extra less significant digits. If the number is too large, signal the error. (One way is to print asterisks instead of digits.)

More elaborate routines can go on to:

5) Check the specification for signs and place properly — for example, add "+" to positive numbers, and put in the desired column. (+ 123 vs +123 & so on).

6) Add leading and trailing zeroes as needed.

7) Decide whether to suppress a trailing decimal point for integer numbers. (Change 12345. to 12345).

There are several ways the PET displays a number, depending on its value:

Integer	123
Fixed Point with Decimal	1.23
Scientific Form	1.23E+15

First, let's make a short program to do Step 2, and to allow entry of test numbers:

```
10 PRINT"clr TEST FORMAT ROUTINE"
20 INPUT"NUMBER sp sp sp sp sp sp sp :";N
30 PRINT"PET SEES IT AS:"N
40 GOSUB 9000
50 PRINT"FORMAT SEES sp sp sp:"R$
60 PRINT
70 GOTO 20

9000 REM FORMAT ROUTINE
9010 REM CONVERT TO STRING
9020 R$=STR$(N)
9030 RETURN
```

When this is RUN, we get a display of the three views of our number:

PET,con't...

```
RUN
(screen clears)
TEST FORMAT ROUTINE
NUMBER       :? 123              (You enter 123)
PET SEES IT AS: 123
FORMAT SEES   : 123

NUMBER       :? .ØØØ123
PET SEES IT AS: 1.23E-Ø4
FORMAT SEES   : 1.23E-Ø4
```

When debugging the program these three views will prove beneficial. As you will notice, the PET likes to change your entered number's format, so the formatter won't see the number you entered in the same way as you do.

For convenience in handling, I chose to have the format routine see a number as:

(Sign)(Mantissa)(Exponent)

The mantissa would always be a fraction — i.e., 8.23 would be seen as:

(+)(823)(+1)

Note the mantissa assumes a decimal point as the first character.

The first task is to break the STR$ string into these parts:

```
9030 REM FETCH SIGN
9040 S$=LEFT$(R$,1)
9050 R$=MID$(R$,1)
9060 REM CHECK IF SCIENTIFIC
9070 FORJ=1TO LEN(R$)
9080 IF MID$(R$,J,1)="E"THEN 9210
9090 NEXT J
9100 REM NOT SCIENTIFIC FORM
9110 REM SCAN FOR DEC PT
9120 FOR J=1 TO LEN(R$)
9130 IF MID$(R$,J,1)="." THEN 9180
9140 NEXT J
9150 REM NO D.P. MEANS INTEGER
9160 M$=R$:E=LEN(R$):GOTO 9310
9170 REM CONVERT FIXED POINT
9180 E=J-1: IF E=0 THEN 9310
9185 M$=LEFT$(R$,E)+MID$(R$,E+2)
9190 GOTO 9310
9200 REM SCIENTIFIC FORM
9210 E=VAL(MID$(R$,J+1))+1
9220 R$=LEFT$(R$,J-1)
9230 M$=LEFT$(R$,1)+MID$(R$,3)
9300 REM SHOW PARTS
9310 R$=" SGN:"+S$+" MANT:"+M$+" EXP:"+STR$(E)
9320 RETURN
```

This complicated code "parses" the string R$ into the parts S$ for the sign, M$ for the mantissa, and E for the exponent.

A RUN will show some examples:

```
TEST FORMAT ROUTINE
NUMBER       :? 123456
PET SEES IT AS: 123456
FORMAT SEES   : SGN:  MANT:123456 EXP: 6

NUMBER       :? 45.26E-12
PET SEES IT AS: 4.526E-11
FORMAT SEES   : SGN:  MANT:4526 EXP:-10
```

This looks pretty good — 123456 is .123456 times 10^6 and so on. However, a test of values like .0345 doesn't work very well (Try it!). It is important to try **all** combinations with programs like this — or take a lot of embarrassment.

The first fix is:

```
9180 E=J-1:IF E=0 THEN M$=R$: GOTO 9310
```

This gets the mantissa back — but the mantissa will still have a leading zero for values like .0234. A better fix is:

```
9180 E=J-1:IF E>Ø THEN M$=LEFT$(R$,E)+MID$(R$,E+2)
     :GOTO 9310
9185 M$=MID$(R$,2)
9187 IF LEFT$(M$,1)="Ø"THEN R$=M$:E=E-1:GOTO 9185
```

Now all is well — and another bug (I won't tell what!) has vanished also. A look at the code is instructive.

My approach is to handle the formatting as a pure "numbers as strings" approach — all tests and manipulations are in the form of string operations. There are cases where the PET won't test numbers accurately, and R$ already has the value that the PET wants to print.

Line 9040 takes the first character, which will be a space or the minus sign, and puts it into S$ for later reference. Line 9050 "snips off" this character from R$ since we don't need it any more.

Lines 9060 to 9090 look through the number for the letter "E" which tells us if a number is in Scientific Notation. If we have Scientific Notation, the number is always in the form:

D.DDDD . . . E±DD

In Line 9210 we make E equal to the value of the exponent by looking at the portion of the string **after** the "E." When we make the mantissa to the form desired, a division by 10 will take place, forcing the value of E to become one more — so this is also done in advance in Line 9210.

9220 removes the part with the "E" and the exponent since it isn't needed now. Line 9230 rearranges the remaining digits to remove the decimal point — in Scientific form, the decimal point is always in the second position. Lines 9300 to 9320 re-compose R$ as a test display for debugging.

If the number isn't in Scientific form, it is either an integer or a fixed point number. Lines 9120 to 9140 look for the decimal point as a way to telling. If a decimal point isn't found, Line 9160 creates the mantissa by just taking the digits. Since integers imply a decimal point at the right end of the number, the exponent is simply the length of the digits string! (Nice, huh?)

Fixed point numbers are a bit tricky — we have several kinds:

```
123.456
 1.23456
  .123456
  .0123456
```

The first two examples, where a digit **precedes** the decimal point, are handled in Line 9180. E is the position of the decimal point less one, and the string formula removes the decimal point from the digits string R$.

If E is zero, we have one of the two remaining cases — the first case is to just remove the decimal point in Line 9185. However, in some cases, the number will have a leading zero, which is checked for in Line 9187. By jumping to 9185, an unlimited number of leading zeroes can be removed, though this isn't required for the PET. (My real motive is to re-use the code in Line 9185 to destroy the zero — and why not? It is **my** program, after all!)

Now that the number has been "crunched," let's take a look at Steps 1 and 4. As this program is an example, I will use the format specifier F$ as:

```
F$ = "DDDDDD.DDDDD"
```

Here the number of leading digits is specified by the number of "D"s before the decimal, and the number of trailing digits by the number of "D"s after the decimal. If the letter "S" appears as the first letter, the sign will be printed in this position. Otherwise, the sign won't be printed at all. (Gives you something to think about.)

If a number is too large to fit, asterisks will be printed instead. Small numbers will have leading zeroes added, and trailing zeroes will always be added to fill the space after the decimal with digits. If no decimal point appears in F$, the integer value will be printed.

Whew! Here is the code to add:

```
9300 REM ANALYSE FORMAT STRING
9310 REM PUT SIGN IN R$ IF NEEDED
9320 R$="":F1$=F$
9330 IF LEFT$(FS,1)<>"S" THEN 9370
9340 IF S$="sp" THEN S$="+"
9350 R$=S$:F1$=MID$(F$,2)
9360 REM GET # OF D'S ON BOTH SIDES
9370 F1$=F1$+"!"
9380 FOR J=1 TO LEN(F1$)
9390 IF MID$(F1$,J,1)="D" THEN NEXT J
9400 D1=J-1
9410 F1$=MID$(F1$,J+1)
9420 D2=LEN(F1$)-1
```

Let's have a look at what this does. Lines 9310 to 9350 check the format string for the letter "S" which means that the sign is to appear. Since scanning the format string is going to take it apart, F1$ is used instead — so F$ is preserved. Line 9340 replaces a blank with the "+" for positive numbers. In Line 9350, F1$ has any "S"s removed.

The next step is to find D1, the number of "D"s on the left side, and D2, the number of "D"s on the right. The "!" is added to F1$ to prevent a disaster when the scanning loop goes past the end of F1$. (The PET string functions hate to see zero as their numeric arguments — so devious tricks must be done to prevent this awful event.) Note the odd construction of the loop — it keeps going until a non-"D" is seen (This will be "." or "!").

When the loop stops, D1 is known — see Line 9400. D2 is known indirectly — as what's left over. Line 9410 makes F1$ the "left over" part on the right of the decimal (or "!"). Line 9420 is a nasty trick. First, it is possible to have no decimals on the right, but a decimal point, such as "DDDDD." This makes D2 zero (Remember that the "!" was added to F1$ earlier.) An integer format, like "DDDD" makes D2 -1 — this is a handy flag for this case for later.

Now for more code.

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PET, con't...

```
9500 REM BUILD NUMBER AS FIXED PT
9510 REM RL$=LEFT SIDE
9520 REM RR$=RIGHT SIDE
9525 RL$="":RR$=""
9530 REM REMOVE TRAILING ZEROES FROM M$
9540 M$="#"+M$
9550 IF RIGHT$(M$,1)="Ø" THEN M$=LEFT$(M$,LEN(M$)-1)
     :GOTO 9550
9560 M$=MID$(M$,2)
9570 REM SET ZERO FLAG
9580 ZF=0:IF M$="" THEN ZF=1
9590 REM BUILD LEFT SIDE
9600 REM ADD ANY TRAILING ZEROES
9610 IF ZF THEN RL$="Ø": GOTO 9710
9620 IF E <= LEN(M$) THEN 9650
9630 RL$=M$:FORJ=1 TO E-LEN(M$):RL$=RL$+"Ø"
     :NEXT: GOTO 9710
9640 REM NO TRAIL ZEROES
9650 IF E<1 THEN RL$="": GOTO 9710
9660 RL$=LEFT$(M$,E)
9700 REM BUILD RIGHT SIDE
9710 REM SEE IF ANY RIGHT SIDE
9720 IF E>= LEN(M$) THEN RR$="":GOTO 9820
9730 REM ADD ANY LEADING ZEROES
9740 IF E>=Ø THEN 9770
9750 M$="Ø"+M$:E=E+1:GOTO 9740
9760 REM CHOP OFF
9770 M$="!"+M$:RR$=MID$(M$,E+2)
```

The objective here is to make two strings, RL$ and RR$, which hold the number in fixed point form, with any leading or trailing zeroes added. We begin by noticing that a number like 1000000 will end up in M$ as "1000000" since no precautions were made for trailing zeroes. Lines 9540 to 9560 get rid of these. If the number originally was a true zero, this leaves M$ as a null string. Lines 9570 and 9580 take note of this by setting a flag, ZF.

Now it's time to get the left-hand side of our number. If the number is zero, it's simple — the string is a "0". Line 9610 checks this one.

E, our exponent, is handy for locating the position of the decimal point in the mantissa. If the mantissa is shorter than the value of E, some trailing zeroes must be added. (Around this time I had to resort to pad and pencil to see what's what.) Lines 9620 and 9640 add any needed zeroes. The value E-LEN(M$) tells how many zeroes to add.

If E is less than one, there isn't a left-hand side. See Line 9650. Line 9660 is the "normal" case where all is well-behaved. (Hah!)

Ho Hum, and it's time to do the right side. Line 9720 sees if there is one at all . . . M$ has to be longer than E characters here. In Lines 9740-9750 the reverse problem of leading zeroes is handled. Each leading zero means that E is increased by one, and eventually E will reach zero — then Line 9770 takes the scissors and makes the right side at last.

If you are determined to make all this work, use a pencil and pad to draw your numbers, mantissas, etc. Diagrams are a great help.

Now that the number has been reconstituted and the format specification analysed, it is time to create the formatted result. The value of D2 lets us distinguish between pure integers without decimal points and fixed point values. The pure integer case is handled as follows:

```
9800 REM BUILD RESULT FROM ALL THIS
9810 REM DO PURE INTEGER CASE
9820 IF D2> -1 THEN 9950
9830 REM OVERFLOW
9840 IF LEN(RL$)> D1 THEN FOR J=1 TO D1:
     R$=R$+"*":NEXT:RETURN
9850 REM ADD LEADING SPACES
9860 IF LEN(RL$)=D1 THEN R$=R$+RL$:GOTO 9890
9870 RL$="sp"+RL$:GOTO9860
9890 REM FIX FOR ZERO
9900 IF RIGHT$(R$,1)="sp" THEN R$=LEFT$
     (R$,LEN(R$)-1)+"Ø"
9910 RETURN
```

A value of D2 that is -1 means an integer is at hand. Line 9820 checks for this. If the right-hand result is longer than D1, the number of digits allowed in the format, the number is too large. Line 9840 checks this, and builds the rest of R$ into asterisks to indicate the problem. There is no use in going further in this case, so we RETURN.

When the result, RL$, fits the space in the format, our job is done (almost). Lines 9860 and 9870 add blanks in front until a fit is found.

Sometimes the number is a fraction, like .123. When RL$ was created, a fraction returns RL$ as a null string — now filled with blanks. As far as we are concerned, the value of zero, so Line 9900 checks and the last digit, and replaces a space with a zero if needed. At last! We are done with the integers.

The non-integer case is handled by this code:

```
9920 REM NOT AN INTEGER
9930 REM LEFT SIDE
9950 REM OVERFLOW ?
9960 IF LEN(RL$)>D1 THEN FOR J=1 TO D1+D2+1
       :R$=R$+"*":NEXT:RETURN
9970 REM ADD LEADING SPACES
9980 IF LEN(RL$)=D1 THEN R$=R$+RL$:GOTO 10010
9990 RL$="sp"+RL$:GOTO 9980
10000 REM RIGHT SIDE
10010 R$=R$+".":IF D2=Ø THEN RETURN
10020 REM TRAILING ZEROES
10030 IF D2<LEN(RR$) THEN 10050
10040 RR$=RR$+"Ø": GOTO 10030
10050 R$=R$+LEFT$(RR$,D2)
10060 RETURN
```

Lines 9920 to 9990 act in the same way as Lines 9840 to 9870. Note that the filling with asterisks must fill the entire format specification, D1+D2+1 (recall the decimal point!)

Line 10010 adds the decimal point, and if there is no right side, we are done. In 10030 to 10040, the length of the right side RR$ is checked, and zeroes are added until RR$ is longer than the right-side format. Line 10050 trims off the excess, and we are done!

To test these formats, insert:

```
15 INPUT"FORMAT STRING:";F$
```

Take this routine and use it in your programs — and see if it is of any use to you. A lot of "shrinking" can be applied — my approach was to do everything in tiny steps so I knew how my bugs worked! □

HARDWARE »Repeat Key«

A Review of the Latest Kingston Computers Accessory

This product is not (as the name might suggest) a separate key for providing a repeat function. Rather, it is a small PCB fitting between PET's keyboard and Main Logic – to provide auto-repeat for all the keys in the numeric keypad.

With the device installed, these keys will register once when pressed. If they are held down for more than half a second, however, they repeat at a fairly rapid rate. This makes possible fast cursor movements for text and program editing, or repeated direction numerals for space game addicts.

The 5cm square PCB is pushed onto two of the sockets on a 16K/32K PET logic board. Full installation instructions come on a cassette, with graphic diagrams to show where the sockets are located. The process takes about 5 minutes and the rubric stresses that no soldering (and hence no danger to warranties) is required.

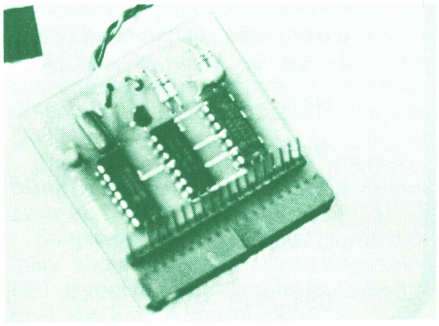
Likes: The device is compact, well made and easy to install. Being hardware only, the repeat function is available after switching the power on.

Dislikes: Although the numeric keys worked very well, it was more difficult to position the cursor when it flashed on and off at its normal rate. A software fix to speed up the flashing frequency is provided on cassette, though this must be loaded each time. We also thought that 0.5 seconds was a rather long delay, but this is purely personal taste. It can apparently be changed with an additional capacitor, though Kingston Computers say that no one has asked them to change the timings yet.

Product Name: PET Repeat Key.
Distributors: Kingston Computers and other dealers.
Price: £17.50.
Value for money: ***
Usefulness: ****
Fun rating: **

(PRINTOUT ratings:
*Poor to *****Excellent)

John Chew, of Kingston Computers says that he has developed an uprated version of the repeat key, which will shortly be on sale for around £30. All keys on the keyboard will be covered, and will give an optional audible 'ping' when pressed. Another particularly useful feature is that RUN/STOP and '=' when pressed together will activate the Reset line and un-crash the system (see PRINTOUT, Vol. 1, No. 1).



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PETS & PIECES

by GAVIN SANDERS

It's Geere, again!

My, but there's been a lively postbag this month, with the redoubtable Ron Geere, IPUG magazine editor, well to the fore. Regular readers will recall that Ron and I have been having a sort of public relationship (we *have* to stop writing like this, Ron – people will get suspicious) on the subject of tokens.

Maybe I'd also better say that IPUG stands for Independent PET Users' Group, the only other lot, apart from us here at PRINTOUT, that's worth knowing.

It all began in an earlier issue, when I 'discovered' (I have to put quotes round 'discovered' now; it's all Ron's fault) that if I entered a graphics character after a REM in a program line, the character magically changed to a BASIC expression when the program was listed.

Innocently, I mentioned this 'discovery' in my column. And was straight away struck by several bolts of Geere-hurled lightning. In the nicest, but most electrifying way, you understand.

Well, folks, it seems there's much more than meets the eye in this whole business of tokens, and boy, am I now wiser.

Tokens (for us hackers) aren't those things you pop into a car-wash coin-box. They're actually a cunning device to speed up BASIC program execution (or, more accurately, prevent it slowing down to a snail's pace), and also to save fairly hefty chunks of memory overall.

But is this information any use? "It sure is!" hollers Ron, and by golly! he's right. Not that I *knew* all this before, but as of now, I'm thigh-high in token information.

Suppose, says Ron, you need a program that rewrites itself! (Even if you suspect that a problem program you've slaved over for weeks is doing *exactly* that, keep reading!)

Take, as an example, a PRINT statement inside a loop, which you only want to print first time round. The smart answer is to POKE the address of the PRINT token to 143, after it's done the initial print. This will convert it – presto! just like that – to a REM (the token for which, you'll quickly guess, is decimal 143). And, of course, it won't do anything from then on.

The only snag for the laggards amongst us is an easy way of finding the address of the PRINT token.

Ron, are you still out there?

Me, I'll content myself with two quotes. One's from Harvey Herman, University of North Carolina, no less. In COMPUTE, an American magazine, Harvey said last autumn: "The latest buzz-word in computer circles is tokens . . . many people are confused and want to know more."

The second quote was written just before Harvey put pen to paper. It says: "When I published a list of PET's tokens, someone said: 'Very interesting, but what use are they?' *Many months later I have found the answer.*"

The author goes on to say he'd discovered that tokens would let him reduce a 100-character line to just 80 characters. Which sounds quite a long way from programs that rewrite themselves, but there.

Oops,. sorry! I forgot to say who the second author was. Silly me. It was none other than Ron Geere, in the IPUG magazine.

Ah, there's no prophet like one converted!

Going down!

Had another letter from that nice man at Supersoft. You'll remember that I talked about a Supersoft program called 'Air Attack' in the last PRINTOUT, and enthused quite a bit.

Now Mr Supersoft writes to say that he isn't only a games inventor – he's into programming aids software and the like, and he included several programs to prove it.

I especially liked one called 'Shrink' which, I promise you, had not a single psychiatric overtone.

You load 'Shrink' first and run it. The loading takes but a few seconds, and running it takes only seconds more, as a machine language routine zips into the second cassette buffer. Then you type NEW.

Now you load the program you want to shrink, and enter – surprise – SYS 826.

What happens? Every single redundant space, and every single REM statement is snatched out of the program, and everything else is closed up.

The net result is a program that uses a lot less memory space, and in some cases, a heck of a lot less. I got savings of up to 400 bytes on some really loose programs I had hanging around, and never saved less than 50, where there were no REMs at all.

True, you do lose all those lovely explanatory remarks, but if memory space is at a premium, what are you doing with lots of REMs anyway?

Mr Supersoft also (and to hell with the libel laws) has to be some sort of sadist. Why? Because he included, as a sort of afterthought, a game called 'Nimbo'.

Now 'Nimbo' is a bit hard to describe, so let me simply say that it *looks* terribly simple. Ha! So, presumably as an afterthought to the afterthought, and in a very conversational sort of statement, Mr Supersoft said: "I'm sure you'll quickly figure out the winning strategy."

Well, I've nearly worn the oxide off the tape base with the times I've loaded 'Nimbo', and I've nearly worn the unwearable letters off the keys of my big-keyboard PET playing the darn game, and I *still* haven't figured out the winning strategy. In short, I still haven't won!

And I just *know* what's going to happen now. Ron Geere's going to get a copy, and he's going to do it immediately without even sweating, and I'm going right out to kill myself.

Laureates of the World, Unite!

Here's a true story, I swear. There are three characters, but for reasons that will emerge, I can identify only one. That's my PET.

Character 2 is a leggy 17-year-old lad, riding up to 'A' levels, and currently working on the poetry of two world wars. That's one of the English exam things, I'm told.

Character 3 is his English mistress, for and about whom he has several quite interesting descriptions, not one of which may appear in a magazine such as this.

Now he's really quite good at English, and has a fairly lively imagination (not that he'd ever admit it). He even enjoys working on the poetry of both wars (and he'd certainly never admit that).

But this enjoyment visibly diminished when he was recently commanded to create some war poetry of his own by his English mistress.

Apparently he'd been overheard saying that any fool could write rubbish like that. Ah, waves of nostalgia!

Anyway, he came round that evening and rammed Petsoft's poetry program into my PET. After a few minutes thoughtful examination of the data banks of words in the listing, he changed some of them, with an appallingly malevolent grin.

Out came soft sweet expressions, and in went nasty things like 'blood', 'skulls', 'mud', 'screaming', and so on. I turned away; made me feel quite ill, it did.

After seven or eight trial runs, the upshot of it was an eight-line couplet that fairly dripped with gore.

And the ending? Disbelieving expressions of amazement and delight from the English mistress who declared PET's effort as being "rich in visual imagery, and quite extraordinary for one so young and inexperienced."

Now I know that my PET's less than a year old, but cor! And for you moral people out there, I also know that I should blow the whistle on my young friend, but somehow I simply can't bring myself to it!

The 'Try These' Corner

If you're anything like me, you've got dozens of unlabelled cassettes around, some blank and some not.

And from time to time, you need a blank one in a hurry, but get seized with misgivings about the priceless unfinished program you may obliterate, by putting something else on top.

You already have a program in PET, so you can't try a LOAD with the spare cassette, to see if it's blank or not, so what do you do. Put it in and hope for the best? Don't!

There's a way of checking whether it's blank or not, and you don't have to move away from PET to do it.

Simply put it in the cassette player, press 'play' and also press the 'less than' key on PET. If your mystery cassette has a program on it, you'll know very quickly.

Try it!

HIGH RESOLUTION GRAPHICS

A Review of the MTU Visible Memory Board

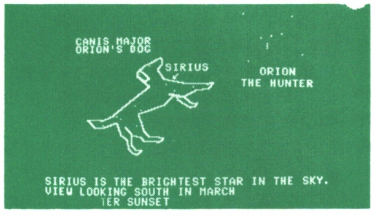
Users Report

by Michael J. Smyth, Department of Astronomy, University of Edinburgh

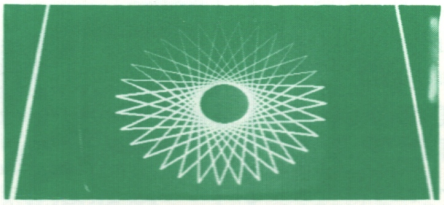
According to a recent survey the third largest group of PET users are those in the Scientific and Technical fields. PET is useful in this application, which also covers Research and Development, because it is self-contained with good interfacing and a reasonable range of scientific functions. A common requirement from such users is the ability to plot graphs, and simple routines were quickly developed to do this on a PET. However, such methods will still only give a qualitative guide as to the ordinate of a function. Smooth curves and accurate line drawings have, until recently, been enjoyed only by PET's competitors.

Several technically-minded users have argued that with full access to the memory expansion and video ports, it would be quite possible to attach a high-density capability. A Stateside company – Micro Technology Unlimited have been advertising such a product for several months; but only recently has it been made available in the U.K., imported by IJJ Design Ltd.

Glancing through IJJ's catalogue, it becomes apparent that the high density graphics system is composed of several units. The central component is the so-called 'Visible Memory' (VM) costing £174, which consists of 8K of RAM attached to PET's memory expansion port. Under this arrangement, the unit can double up as 8K of ordinary memory expansion. Also necessary is the PET-to-MTU interface for £71, which includes the necessary video logic to display the contents of the VM on the PET's screen. A second monitor can also be attached directly to this interface and switched to show PET's normal display, or the VM, or whatever PET's screen is showing. The two optional items are the graphic software at £14 which provides a number of aids to drawing and plotting, and a steel card file (£54) which holds all the electronics cards, as well as other MTU units – such as the music synthesiser and 16K expansion memory. We tested the full system, which is available for the a ne price of £299.



Installing the unit is relatively straight forward, and the documentation supplied is accurate and clear (though our reviewer felt rather silly when told to remove his rubber-soled shoes before handling the static-prone CMOS memory!). Units are generally plugged together, with frequent checks that the system is working as it should at each stage. However, the main power supply (3 wires) must be soldered onto the Power Diodes on PET's Logic Board (front left), and it is this aspect that disturbs us most. What MTU fail to point out is that the diodes have large areas of PCB tracking to act as heat sinks for normal operation. This makes it difficult to melt the solder with anything other than a powerful soldering iron without consequent risk to the semiconductor devices. It is almost certainly worth paying a few pounds to let your dealer do the installation, unless you are practised at this kind of soldering. We are currently pursuing Commodore regarding the effect on Warranty – especially since the MTU board is now an Approved Product.



Having completed the installation (in less than half-an-hour) we plugged all the units into the cardfile. This held all the boards on one bus and kept them above the working surface. However, the steel frame (which was evidently designed originally with the KIM in mind) is not enclosed. IJJ Design said that they were considering a metal case to keep the dust out, so our advice is not to buy the cardfile unless you have several MTU boards, or a cover is supplied as well.

Several demonstration routines are given in the manual, though ours failed on the first run. This was caused by one of the address 'jumpers' being in the wrong position but this was easily changed (rather useful because it means that the 8K of RAM can be located anywhere in memory space). After this minor problem, everything worked as predicted in the book.

The Video Memory is displayed on PET's screen after a software (POKE) switch is set. This causes the picture to bounce dramatically for about 1 second, then leaves a steady display. The 8K bytes are POKEd and PEEKed like the normal display, using AND, OR and NOT functions in BASIC to access the individual dots or PIXEL's. The Graphic Software programs provide machine code routines for effecting fast plotting, lines and clearing etc.

Our only criticism of the documentation is that it contains no worked examples. However, once started, it does not take long to start plotting graphs – complete with scaled and labelled axes. We managed to write a very crude form of CAD program, enabling one to turn a cube about any of its axes. Another fascinating (if useless) example was random drawing, keeping us transfixed with PET's imaginative maps and doodles!

Several other programs were supplied, including EXDRAW in which points could be moved on the screen connected by 'elastic' strings, and a Character Font enabling foreign alphabets and even £ sign.

This product is not cheap, but for the user with a specific application in mind, it provides good quality high-density graphics on a computer which has almost everything else.

We are PET-lovers in the Department of Astronomy, largely because of Commodore's foresight in fitting the IEEE488 interface, which allows us to use PETs easily and for many data-collecting and processing applications in teaching and research. Plotting data as graphs on an X-Y plotter such as the Tektronix 4662 is again easy, thanks to the IEEE488 interface, but involves an additional instrument costing nearly five times as much as the PET itself.

Crude graphs can indeed be plotted with the screen display of 40×25 characters, which may be increased to 80×50 'points' with an efficient (60 'points' per second) machine-language double-density routine such as that published by Tony Clark in *Practical Computing*, July 1979. For no extra cost, this is well worth trying.

The Visible Memory (VM) board supplied by Micro Technology Unlimited (MTU) is however in a different class, completely taking over the PET display and providing graphics consisting of 320×200 points. At modest additional cost we have a display quite competitive with much more expensive graphics computers. We obtained the boards direct from MTU before they were available in this country, and with the detailed manual provided, had no difficulty in connecting to an 8K PET. Full marks to MTU for documentation – in contrast with early Commodore manuals!

Graphic Software

To control the 320×200-point display, up to 64,000 bits in the VM have to be set to 0 or 1. This would be excessively slow in BASIC – it takes 30 seconds even to clear the screen – so MTU's graphic software package is a practical necessity. This machine code occupies the top 2K of memory, linked to BASIC programs by a short series of subroutines occupying (when explanatory REMarks have been deleted) 497 bytes. This leaves 4620 bytes, or 64%, of RAM free in an 8K PET, and we have not found this restriction troublesome.

It is a tribute to the PET+VM combination that an appropriate system for performance comparison is the Tektronix 4051 graphics computer, costing nearly five times as much. In fact, judged by PCW benchmark tests, BASIC computing on the PET is about two times *faster* than on the expensive graphics computer; but what about the graphics?

The main difference is that the PET screen is continually refreshed from an array of stored values in the VM, whereas the 4051 uses a storage screen on which each line is drawn once (and cannot be erased without clearing the entire screen). PET 'curves', consisting of discrete points, look a little ragged compared with the smooth curves that can be drawn on a storage screen. The screen resolution is comparable: PET displays 320 discrete X-values, whereas the 4051 display is 130

'units' wide and lines ½ unit apart are distinguishable.

BASIC Subroutines

Drawing graphs with the PET+VM system is quite straightforward. With the MTU software in the top 2K of memory (read from cassette or disk) and protected from BASIC, the user's program must incorporate the few lines of linking subroutines. Here are some examples of commands needed for plotting, contrasted with the more compact forms in 4051 extended BASIC:

	PET+VM	*4051*
clear screen	*GOSUB 101*	*PAGE*
plot point at (A, B)	*X1*=A: Y1= B:GOSUB 108	MOVE A, B
draw line to (C, D)	X2=C: Y2= D:GOSUB 106	DRAW C, D
print string S$	GC$=S$:GOSUB 124	PRINT S$
revert to normal display	GOSUB 116	—

Note that a graphics computer with storage screen does not have the ability, rather useful when editing and debugging, to switch between normal and graphics display. Also the MTU software makes it easy to remove and replace lines and points, as in interactive or animated displays; this is impossible on a storage screen.

Reasonable Speed

Speed of plotting when using the MTU software is very reasonable: a 'curve' of 320 points spanning the screen takes 32 seconds, while 100 'lines' connecting endpoints require 24 seconds. This is about half the speed of the 4051 graphics computer.

Using PET+VM to display computed data presents no particular difficulties, though it is somewhat slower and clumsier than a dedicated graphics computer with extended BASIC. 'Instant' display of experimental or computed data is most useful, and the user's program can incorporate a set of essentially parallel commands so that, when required, the display can be transferred to a hard-copy plotter. Some university departments have extensive packages of teaching programs written for the Tektronix 4051, and it appears that these could be successfully re-written for PET+VM. And for 'fun' computing and computer 'art' the high-resolution display has possibilities limited chiefly by the programmer's imagination (try plotting a polygon with random vertices, then re-plot by applying repetitively a set of randomly-generated increments).

Very Competitive

In short, the VM boards endow PET with the capability to generate screen graphics competitive with those of a much more costly graphics computer:

(i) resolution comparable;
(ii) curves somewhat 'ragged', but eraseable;
(iii) software adequate, but unsophisticated;
(iv) plotting speed half that of graphics computer.

Finally, a suggestion for an enterprising manufacturer. The plug-in ROM 'Programmer's Toolkit' for the PET adds useful extensions to BASIC. What about a 'Graphics Toolkit' comprising MTU graphics software plus some extra BASIC commands like PAGE, MOVE, DRAW, SCALE, WINDOW, AXIS, . . . ?

Editor's Note:
With the new G.R. Electronics EPROM burner, it is now possible to produce your own Firmware.

Low Cost High Resolution Graphics Packge by HB

Since testing the MTU board PRINTOUT has learned of a new high resolution graphics package developed in Britain by Michael Hambly of HB Computers, to sell at less than £100.

Once installed one quarter of PET's screen can be reserved for high resolution graphics use. The X, Y co-ordinates of any individual point are accessed via a machine code routine held in the second cassette buffer. PRINTOUT's correspondent reports that the results of sine waves plotted in this manner were extremely effective.

An additional benefit is the ability to define new characters. We were able to convert the $ sign to a £ character and to program special symbols for circuit diagrams, without difficulty. Such characters can be manipulated as strings and may also be saved on tape for future use.

The package which is due for release by Petsoft later this summer consists of a PC board containing a 1K RAM chip; PET's character generator ROM is mounted in a socket on the board, which is connected to the memory expansion port. One solder only is required.

Full report in next issue.

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DESTRUCTION TEST
The CompuThink Disk

by Newton Don

It was recently suggested that before microcomputer software could gain really widespread acceptance, it would have to be 'idiot proofed'. PRINTOUT commissioned the hypercritical Newton Don to see just how idiot proof the CompuThink disk system is.

Take one idiot, add 800K bytes worth of dual disk storage and you could be left with both drives whizzing round indefinitely.

The CompuThink floppy disk system has been acclaimed for its ease of use. The other side of this coin is a distinct lack of sophistication when dealing with disk software errors. The well written manual is at some pains to explain the correct procedures; idiots don't read manuals.

Clanking Noise

Sooner or later one disk will be found spinning round, and round, and round, with the RUN/STOP key disabled. Fast work is called for; remove the diskette which the PET is attempting to access and press the BREAK key. If you are smart the horrible clanking noise will stop and PET will return to READY mode. If not, it is time to reset.

A similar fate awaits those foolish enough to attempt to save a program onto an unformatted disk. Instead of returning to BASIC the system continues to execute the command – without much success. Calling the DIRectory of an unformatted disk tends to provoke a like response. First Aid requires removal of offending diskette and insertion of formatted replacement – or another reset.

One such strategy much favoured by programmers and idiot proofers is disabling of PET's RUN/STOP key. To achieve this, location 144 is POKEd to 49 (POKE 537,136 for old ROMs). This will cause anguish and distress to the disk system which, like as not, will refuse to work. The solution, as you may have guessed is to restore the original pointer. The following routine achieves this:

```
100 DATA73,3,120,173,58,3,133,144,173,59,3,133,145,88,96
110 DATA32,234,255,169,255,133,155,76,49,230
120 DATA120,169,46,133,144,169,230,133,145,88,96
130 RESTORE:FORI=826TO861:READJ:POKEI,J:NEXT:SYS828
150 REM TURN OFF BY SYS851
```

The CompuThink manual outlines the use of another POKE that can be used for detection of disk errors. What it does not warn you is that after detection of an error, use of the $CDISK command will bring disaster. Better advice is to use either $ERASE,D,"*" or $DIR,D, both of which will stop the drives.

Abbreviated Commands

One attractive feature of the DISKMON operating system is the ability to abbreviate all disk commands to two letters. However, $D,1 can be keyed in as $F,1 – the command to format side one! This sort of thing tends to happen late at night when one is least prepared for a disk to be wiped, especially when it contains the one and only copy of the world's best program.

In like mode, $S,1"PROGRAMNAME" instead of $L,1,"PROGRAMNAME" one can dump a completely blank file on top of the program you intended to load. Not a pretty sight. The Solution, which I admit is strongly urged in the manual, is to keep back-up copies of everything.

The Random (direct) access file management must be the greatest asset of the CompuThink system. It is easy to use and extremely fast. Other systems I have used are left standing. Although DISKMON allows no more than a single channel open at any one time, it

PEEKS & POKES
by Inside Trader

Gossip, Rumours and other Distortions

Desperate Dave Tebbutt, computing's answer to Burt Reynolds, is seen hanging about the shop. Will I write for his magazine, he demands, waving handfuls of fivers. I send him about his business smartly. Now I suppose we shall have to put up with a pale imitation in PCW . . . . . Several dealers have volunteered explanations of how Tiddles acquired his colourful nickname. The politer ones relate to his fondness for pints of crême de menthe frappé . . . . . Visitors to Château Commodore return amazed at the transformation in Nick Green's appearance. The ever affable but newly pin-striped Nick attributes his sartorial retrofit to the kind provision of a roof to his office . . . . . Wanna speed up LIST or PRINT? Try a POKE59458,62 and then LIST. POKE 59458,30 restores . . . . . The supersecret high res. colour PETs – to retail at $495, I hear – have been christened the '5000' series. The last product to bear this designation was the disastrous 5000 watch; known as the *Electronic Edsel,* it nearly sank the Commodore . . . . . Ectomorphic editor Bruce Sawford spends only half his time on *Personal Computer World* these days. The rest is devoted to *Kung Fu Monthly* . . . . . What exactly are those guys up to with their shiny new EPROM burners? Surely they wouldn't stoop so low as to pirate CBM's protection ROM? . . . . . Despite valiant efforts by lissom P.R. lady Ilona Uhl, PET will not now appear on Lance Percival's TV show. According to Lancelot real computers have flashing lights . . . . . Kit Spencer writes to threaten me with executive action by the Commodore S.W.A.T. Squad but adds "I would also like to point out to you the impudent exhibitionism of our Sales Manager, Keith Hall, who, in order to ensure himself entry into your column has just broken his ankle . . ." Discretion – and a healthy respect for the libel laws – dictate that I pass over the exact circumstances of this 'accident' . . . . . *ACT News,* house organ of Petsoft, sets a journalistic standard that is hard to follow. The latest issue leads with the breathless report on the visit to ACT of the President Elect of Liberia. Page Three displays the ample charms of one of Petsoft's packers. I am nominating editor Chris Buckham for Journalist of the Year . . . . . Sir Sheath tells me that he views the PET as a *good thing.* He keeps a pile of catalogues in his desk with which to intimidate the unions . . . . . With City fat cats sniffing around the microcomputer scene in search of an opening, we can expect to see some outstandingly silly schemes receiving finance before the bubble bursts. Several leading PET figures have received job offers at absurd salaries. Stand by for musical chairs . . . . . The Commodore's investigation into my secret identity lumbers on. *Suspect*

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is only necessary to close this (with $CDISK for example) when storing data. So by not switching off the motors when reading records from different files, a considerable saving of time can be effected.

Alas, most applications software I have seen were far from idiot proof. Data files tended to be appallingly badly constructed. Creation of a single massive file results in wasted seconds accessing any record towards the end. A better method is to break the file up into smaller 'pieces'. Petsoft's Stock Control uses this approach with the result that any of 2500 records can be accessed in under two seconds.

Nasty Habits

Looking through some of the other applications software available it is clear that certain programmers have acquired some very nasty habits indeed. Nanny would not approve of storing different parts of data blocks all over the place, out of sequential order.

A much less chaotic method is as follows. Supposing one has set up a random styled file of one hundred records, each of thirty characters in length; five records make up the name and address data block. To access and change any one of the twenty data blocks you could use this routine:

```
100 INPUT"POSITION OF NAME IN FILE";X
110 IF X<1 OR X>20 THEN 100
120 DI$="":R$="":X=X*5
130 $ODISK,2,"O","DATAFILE",DI$
140 FOR A=O TO 4
150 $RDISK;X-A,R$:N$(A)=R$:PRINT N$(A)
160 NEXTA:$CDISK
170 PRINT"DO YOU WANT TO CHANGE THIS NAME?"
180 GETA$:IF A$="N" THEN 100
190 IF A$<>"Y" THEN 180
200 FOR A = O TO 4:INPUT N$(A):NEXT
210 $ODISK,2,"D","DATAFILE",DI$
220 FOR A=O TO 4
230 N$(A)=N$(A)+"
240 N$(A)=LEFT$(N$(A), 30)
250 $WDISK;X-A,N$(A)
260 NEXT A:$CDISK:GOTO 100
```

Complicated Beasts

Despite much puffing and blowing in the popular press, computers are still complicated beasts. Advanced peripherals like disk drives will require more than a double quick punt through the manual before you are familiar with them – whatever the dealer tells you.

The CompuThink disk drive is a very powerful and sophisticated tool indeed. Given a little patience it can serve you well. But idiot proof it ain't.

Next: Newton Don versus the Commodore Disk system.
Watch out for other Destruction Tests in forthcoming issues.

TOMMY'S TIPS!

Many people ask me how to SAVE a BASIC program with a Machine Code subroutine in one go. The answer lies with the Machine Language Monitor found in all new-ROM PETs.

Supposing the Machine Code resides in the second cassette buffer starting at $033A, then using the MLM we can do a Machine Code SAVE from this point onwards, to include the BASIC program as well. Locations 42 and 43 give the location of the top of the BASIC program (they might contain 120 and 50 respectively in LO:HI form). Converting this to a hex address gives us $3278 as the upper limit for the SAVE.

Having rewound the cassette (#1) and entered the Monitor with SYS(1023) the Machine Code and BASIC can be saved in one go with:

S"PROGRAM",Ø1,Ø33A,3278

When finished, return to BASIC with X Return. The complete program can be loaded using a normal BASIC LOAD command.

* * * * *

For users who like to experiment with difficult types of programming, and frequently have to scrap a program and start again, SYS64721 has the effect of turning PET off and on again, but with less wear and tear on the power supply. SYS64824 has the same effect on old ROMs.

This incidentally is the best way to obliterate a program when you do the final exit – useful in Business programs with menus.

* * * * *

It is not well known but on the new PETs a little fix has been made on the LEFT$ and RIGHT$ functions. They will now accept zero as the second argument, without giving an ILLEGAL QUANTITY ERROR.

moles currently include Bob Gleddow, Mr Mike Whitehead, the blameless Yvonne, and sundry Vietnamese in Accounts . . . . .

Out drinking with other dealers I discover a curious thing: five out of seven of us receive at least two telephone calls a week from John Chew of Kingston Computers. Average call length: 42 minutes. Projected over the entire dealer network my PET computes that Deep Throat spends 2054.28 hours and £31,903.20 on the telephone *each week* . . . . . Iron fist, Velvet Glove dept: Commodore factota positively drip charm (quite a feat in itself) when dealing with Ron Jeffries, publisher of the cassette magazine *Cursor*. However, Ron's review of the CBM disk system has been neither forgotten nor forgiven. Expect further executive action from the Santa Clara S.W.A.T. Squad . . . . . Visiting CBM HQ I drop in to pay my respects to Jack Tramiel. I find the President elbow deep in Olivetti typewriters. Commodore started as a typewriter repair company and it seems Jack can't bear to turn away the business

. . . . . I hear that the Russians are attempting to build a Soviet-type copy of the PET. Commodore has been rendered as *'Commissar'* but they are having difficulties with the PET part. Apparently P equals R in the Cyrillic alphabet and RET are the initials of a particularly notorious department of the secret police. It is thought that this might lead to a Negative Market Incentive Situation

. . . . . My friends in the legal profession are rubbing their hands in delight at the prospect of juicy pickings. The multi-nationals now elbowing their way into the computer business do not take kindly to aspersions being cast on their products by teenage journalists. First for the high jump will undoubtedly be *Computing Today's* 'irsute 'Enery Budgett. In the event of writs I shall go underground . . . . . My West Coast mole spotted a new Tandy Computer in the top security wing of a Sunnyvale Software House last week. Bearing the legend TRS-81 it is a colour system, driven by a Motorola 6809. This is the hybrid 8 bit/16 bit CPU which I predict will eventually appear in the SuperPETs. Does this mean compatibility between the three topselling micro-computers? We should be so lucky . . . . . I fear the Curse of the Commodore is about to strike down Guy Kewney, doyen of Computer journalists, following his story in *Computing* about ICL leaning on Commo-dore to change the name of their COMPAY package. Kewney, known in the Trade as the Pink Panther for reasons I will not elaborate on, does not seem unduly worried by the fate lying in store for him . . . . . There is an ironic footnote to Guy's story that has caused smiles in Birmingham. The original COMPAY package it seems was written not by ICL but by ACT, now proprietors of Petsoft . . . . . The effects of his duel of wits with Ron Geere is beginning to tell on Gavin Sanders. Now the Guildford Guru has taken to wearing *bicycle clips* . . . . . The lads in Commodore's technical department are keeping their heads down just now. Seems they came up with a splendid new ROM packed with utilities. Unfortunately, it plugs into the same socket as BASIC 4.Ø . . . . .

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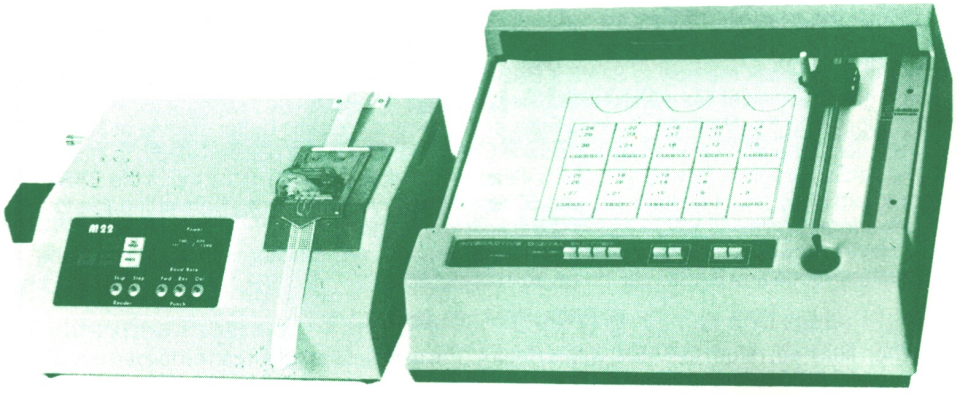

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Life on a PET

by JOHN STILL

This is not 'Life *with* a PET', which has been described by many enthusiasts, but John Conway's game of 'LIFE', which was said at one time to have occupied more computer time at Houston than did the moon-landing calculations!

I was fascinated by the game when it was first described by Martin Gardner in the *Scientific American* for October 1970, and I spent many hours playing it (very slowly and with immense frustration) on squared paper, never imagining that computers capable of playing it would ever come within my financial grasp. Now I have my own PET, with 'LIFE' programs published by at least two software firms, and I am at last able to play it with speed and accuracy. I suscribed to the little magazine *Lifeline,* published to a few hundred 'lifemen' by R. T. Wainwright of New York, for the first 11 issues. (Does anyone know whether further issues were ever published?) I did not succeed in renewing my subscription after September 1973.

Living Organisms

The solitaire game called 'LIFE' (so named, to quote Martin Gardner, "because of its analogies with the rise, fall and alterations of a society of living organisms") consists in following the development of a simple pattern of 'cells' (dots) on a two-dimensional grid divided into squares. Each square is considered to have eight 'neighbour' squares (those touching it either orthogonally or diagonally), and development takes place according to two simple rules:

1. Each empty square with exactly three neighbour cells is a 'birth' square, and a cell appears in it at the next generation.
2. Each cell with either two or three neighbour cells survives to the next generation; those with one neighbour or none die from isolation, those with four or more from overcrowding.

All births and deaths occur simultaneously, and together constitute a single generation or 'move'.

Unpredictable results

Although so simple these rules were chosen with extreme care, and they often lead to most interesting and unpredictable results. Some simple forms die almost at once, some are stable or soon become so, some are or soon become 'oscillators'. For instance:

⁘ dies in two moves, ∴ becomes the stable 'block' ⁘ in one move.

⋯ , the 'blinker', is the simplest oscillator, of period 2, becoming ⋮ on move 1 and returning to ⋯ on move 2.

⁙ becomes a stable 'beehive' (Conway's term) ⁘ in two moves.

∴ in 9 moves becomes a group of 4 blinkers.

Oscillators of all periods up to at least 9 are known, and others of periods 12, 15, 30 and 46. A row of 10 cells gives rise to the 'pentadecathlon', an oscillator of period 15, while a similar row but with one space in the middle ⁙ ⁙ gives the 'Pulsar CP 48-56-72', a period-3 oscillator, the figures being the number of cells in the three different states.

A very few formations actually move across the field; the simplest of these is the 'glider' ∴ which after 4 moves has reproduced itself one square diagonally downwards to the right. There are also a very few which continually increase the number of cells in the field; the most famous of these is the 'glider gun', an oscillator of period 30 which 'fires' a glider every 30 moves.

Gliders and space-ships

The game was of course originally intended to be played on an infinite (or at least very large) field, and the 40 by 25 field of the PET leads to some limitation on the size of pattern which can be followed. For instance (quoting Martin Gardner again) the "way of placing guns so that the intersecting streams of gliders build a factory that assembles and fires a light-weight space-ship every 600 moves', found by the same group at the Massachusetts Institute of Technology who discovered the glider gun, is definitely *not* suitable for the PET!

However, many of the most interesting patterns can be fitted in, including the glider gun, several other 'shuttles', large oscillators, and moving patterns such as gliders, 'space-ships' of various sizes, 'flying machines', and 'puffer trains'; also there is room to trace the results of many collisions of these moving objects with one another and with stationary forms or oscillators.

Wrap-around screen

The side-to-side 'wrap-around' of the PET screen leads to some interesting developments in that the game is effectively being played on the curved surface of a cylinder 40 squares in circumference by 25 high, with a 1-square displacement where the sides join. This means that a pattern which moves horizontally such as a space-ship, if started in the top left-hand corner, will repeatedly move across the screen and reappear at the left-hand side one square lower, until it reaches the bottom right-hand corner about 17 minutes later.

Many spectacular symmetrical patterns run very well on the PET, some remaining within the screen throughout, some being altered in their development by cutting off at the top and bottom or by interaction between the two sides; occasionally they lose symmetry because of the 1-square 'fault' where the sides join.

A famous 7-cell pattern called the 'Acorn' is known to run for 5209 generations on the large screen before reaching a steady state; if placed in a certain position on the PET screen it will run for 920; this is the longest-running non-repeating pattern I have yet found. The notorious 'r-pentomino' of only 5 cells ⁛ is another which cannot reach its full large-screen development of 1103 generations, but it runs for several hundred from the middle of the screen; like the Acorn its length of life and final result depend very much on the exact starting position. The 'pi-heptomino' (Conway) or 'blasting cap' (M.I.T.) ⁝⁘⁝ has a quite spectacular development; it runs for 173 generations on the large screen, but if placed a few squares below the centre of the PET screen it can run for over 220.

100 interesting patterns

Because it seemed possible that I might be the only U.K. PET owner with access to the large amount of material in *Lifeline* as well as that in Martin Gardner's articles and some new items which I or my family have found, we have embodied a collection of over 100 interesting patterns and 'scenarios' in a set of 10 programs, each within 8K and all on a single C12 cassette, which is being published by Petsoft under the name 'LIFE-FORMS'. Each of the patterns, or in some cases several at once, can be entered complete by pressing a single key, and repeated as often as desired. There is no fiddling dot-by-dot and space-by-space counting; this has been done once for all. At the same time there is provision for altering the development by adding or removing dots at any stage, and also for the player to enter his own pattern on a clear screen whenever a new idea occurs to him.

The two machine-code programs now commercially available are issued by Petsoft (Birmingham) and Supersoft (Pinner, Middx.) respectively. I have used the Petsoft version because it runs at the moderate speed of 2 generations per second, which is comfortable to watch and allows one to see fairly well what is happening. The Supersoft program runs at an incredible 12 to 14 generations per second, which makes most oscillators appear as mere blurs on the screen; it is highly spectacular for its fast-moving gliders, space-ships etc., and for large non-oscillating patterns. It has the two further useful features that it can be single-stepped using only the RETURN key, and that it can be set to run for any specified number of generations and then stop. The latter feature, together with its high speed, is very useful in checking the lifetime of objects like the Acorn, which are extremely tedious to count at 2 moves per second. All good lifemen should have both programs available!

Lifeman's Farewell

If any readers have more recent literature, or have favourite patterns or 'scenarios' of their own which they think would be of general interest, I should be very pleased to hear from them, and I will keep a file of such items with the purpose of eventually making up a supplementary program for the further enjoyment of lifemen everywhere. Such a program will include a short title for each pattern, with the name of the contributor unless anonymity is requested.

I will end with the Lifeman's Farewell: "May you never have less than two neighbours, or more than three!"

J. E. Still, 66 Rugby Avenue, Wembley, Middx. HA0 3DJ.

Editorial Suggestion: Why not write a version of LIFE to run on a high-density graphics board. Imagine – 64,000 cells to play with!

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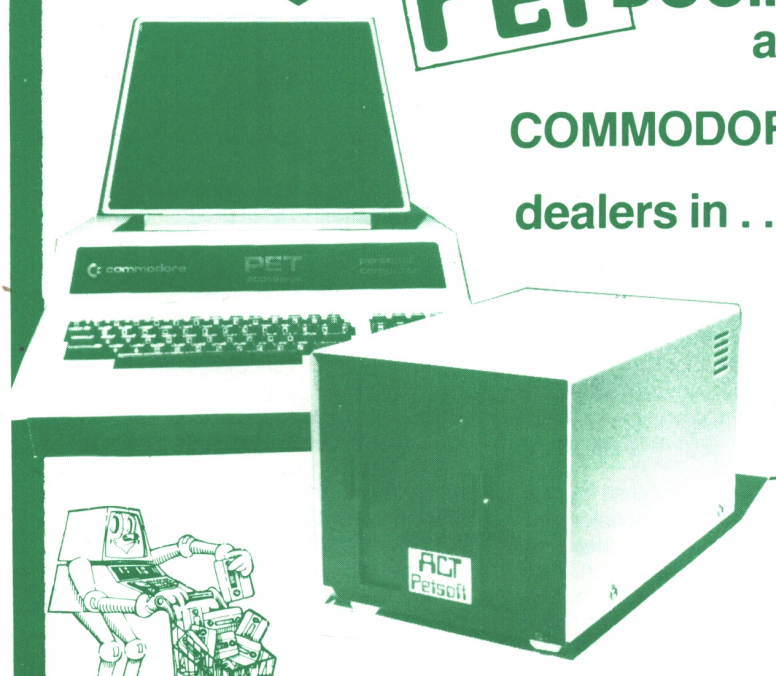

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Local Pet User Groups...

Local PET Users' Groups are now springing up all over the country, and many users are benefitting from their meetings. We invited John Nuttall to tell us the experiences of IPUG (South) – about to split off from the main Group.

You might say that the Group was started from an overwhelming sense of ignorance – my own. Having bought a PET, and not knowing a bus from a byte, I imagined that there might be others in the same boat. So I joined IPUG, and from the mailing list they sent, I wrote to all PET users in a thirty mile radius. Soon the Group was off to a start; five or six people meeting in each other's homes. It was a beginning at least. It also demonstrates that you don't have to be a PET expert to get a Group going, and my advice is to join a local Group no matter what you use the PET for. If you haven't a Group in your locality, then form one yourself.

Regional Group

Life began as a Regional Group for the Independent PET Users' Group. We ran a terrible newsletter and asked folk £1.50 per annum for membership. Monthly meetings began to develop from showing software to a more educational content. We discussed the merits of the PET over and against that other machine with pips in it (Ed – No comments please!). Various magazines began to request details of the Group, membership doubled and then trebled, and so on, until we arrived at 90 on the mailing list: that's not big, but it does mean that we can be personal and not so vast that people feel swamped. However, with increased membership came problems. "And so it came to pass that a new generation knew not IPUG the PET deity, and the High Priests of that foundation became angry and tore their garments . . ." which is another way of saying that we broke links with IPUG over an affiliation issue. We are about to rename ourselves in the near future.

Professional and Amateur

You might say that the Group exists to help members get the most out of their machines. It has a wide cross-section of people in it, from those who are in computing as a profession to those who are just starting off. Personally, I would not like to see it broken down into a PRO-AM grouping because I believe the more knowledgeable have something useful to offer those who are still struggling. Of course, we have a good working relationship with the approved dealers in the area, although we are independent of them and Commodore. Nonetheless, I think we can take some of the pressure off them, in helping to deal with problems and questions.

So much for the historical side – what are we actually doing now? The first necessity was to elect a Committee. Not the sort that just talk, but with each member doing a specific task. We have a Chairman, a Treasurer and meetings manager; the role of the latter is to organise something interesting for monthly meetings. This month we are having a demo of Centronics printers, and next month is an auction (a chance to get rid of surplus programs or hardware that you bought in a fit of spring madness).

Monthly Newsletter

Each month, we have a Saturday training day for members, which costs £2.50 for the day and includes something on BASIC, hardware, disk programming and other such topics. Oh yes, the newsletter still goes out each month, but it's a bit better now than it was: at least we can do listings, and it is open to anyone to shout his/her head off about anything. We receive software for review from all major sources, with one or two exceptions. These programs are sent out to individuals who are considered experts in their work; the stock control program will be sent to the sales rep, and the teaching program will be mailed to the teacher etc. That way, at least they know what they need (or get) from software.

We pride ourselves on excellent links with the USA, where software is much cheaper than over here. Plans for the future include a disk-based index system for all PET-related articles that have ever been printed. Quite some task! We hope in the near future to start a machine-code study group.

Special Interests

We have issued to members, a list, with addresses, of all the Group, with special interest categories. This means that anyone who is interested in PETs and music can contact another like-minded individual. This in itself has led to 'special interest' sub-groups. One such group is concerned with PETs & education; another with business applications, another with the scientific field, and last but not least, a games sub-group. (Did I see someone last week connecting a coin box to their PET?)

Just two points in conclusion. The first concerns reliability of the PET and its peripherals; I know of very few cases of the PET needing a vet. Secondly, I think, as a Group, we have still a lot of work to do in helping people run the application for which they first purchased their machines. There is a certain gap between what you thought it could do, and what it actually will do for you. This is largely a software limitation, but it's enough to make some individuals give up altogether. The only limitation to the PET is your imagination – and Commodore aren't paying me to say that!

If anyone is interested in further details, please write with a S.A.E. to: H. Pilgrim, 42 Compton Road, Brighton, Sussex.

The letter below is from Jim Cocallis, organiser of the North-East PET Group.

The North-East PET Group was formed about a year ago with the simple aim of promoting the PET as a microcomputer worth using. The original group was small – about 15 people, but enthusiastic and the group has consequently grown quite rapidly; we now have about 50 members and still growing. About half of our members are still at school (all 14+) and at times their skill leaves some of the older members feeling giddy.

Among our members we have three Petsoft authors, the consultant, Tommy Turnbull, four computer engineers and a number of PET suppliers. In the future I hope to involve people in a specific project but time is the big problem – not enough of it.

We currently meet three times per month, 2nd, 3rd and 4th Tuesdays when we cover software, demonstrations and hardware respectively. We meet at 7pm in the PETlab, Ellison Bldgs., Newcastle Polytechnic, Newcastle-upon-Tyne. The software evening is currently covering basic machine code programming – the talks are given by a programmer who is in PET software sales. The hardware evening is covering the PET, however, it is planned to delve into the construction of various interfaces when the PET hardware has been covered.

The group is a sub-group of the Newcastle Personal Computer Society (the largest I might add) for which an annual subscription of £5 is charged (£2.50 for junior members). This fee covers the following:

1) Monthly meeting on the 1st Tuesday – all well known makes of micro have been demonstrated as well as some home-brew systems.
2) A beginners night – 2nd Wednesday – the basics are being covered and no previous knowledge is required.
3) A Z80 group meets on the 1st Wednesday – all members are welcome.
4) An S100 group meeting – varies.
5) Three PET meetings.

VERY good value for money. We have over 80 members and growing rapidly. A monthly magazine is produced (sample included) which is very well edited by Peter Scargill.

We welcome anyone who comes along and the first two attendances are 'free' so there is time to 'suck it and see'.

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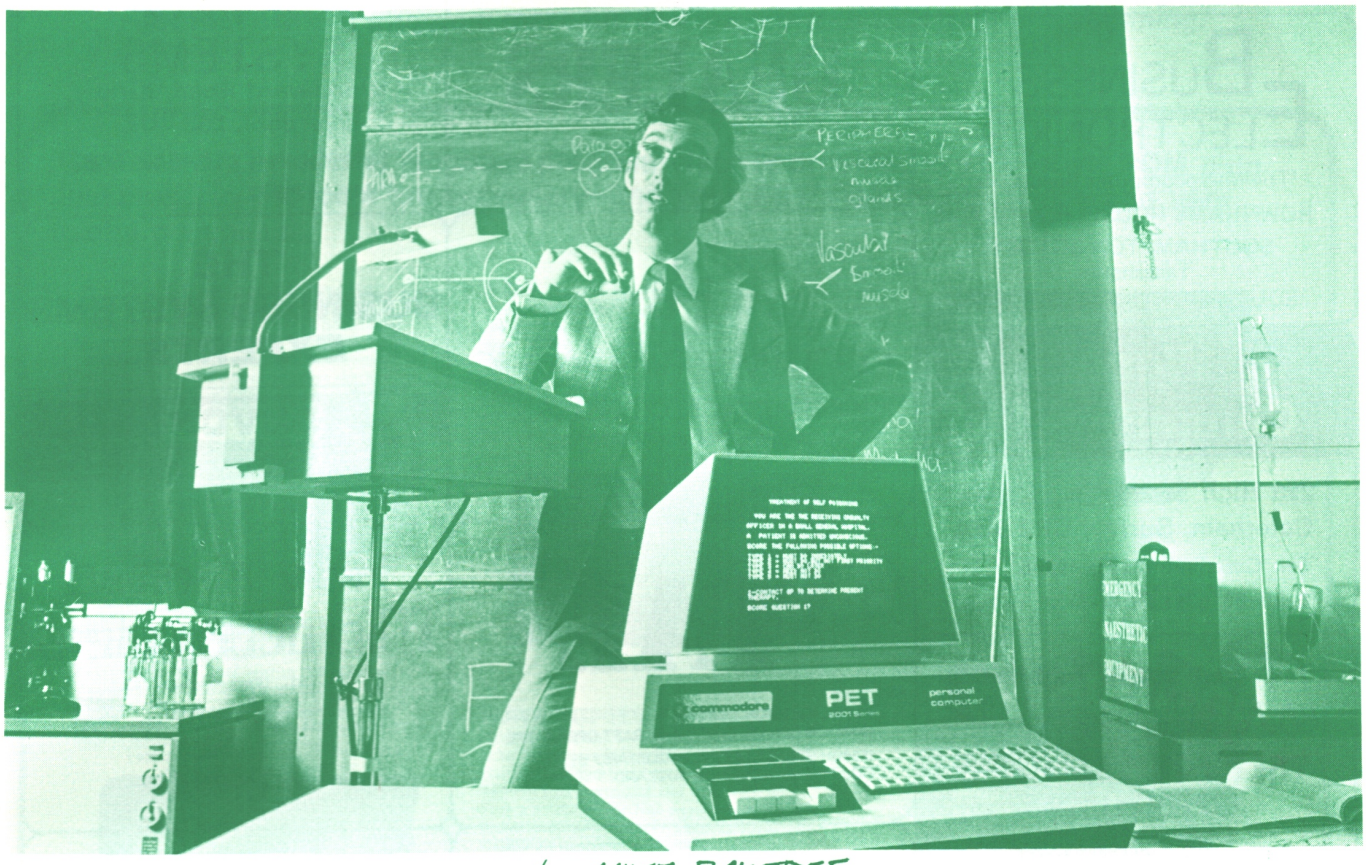

by MIKE BAWTREE

In this issue of PRINTOUT, we begin a new series on Educational software for the PET. We shall be examining the programs available – how good they are, their suitability for use in schools, what is really needed, and so on. There is an inherent problem in tackling an exercise like this – in that no two teachers seem to agree on the subject of Computer Aided Learning. Nevertheless, we felt it necessary to have all the software evaluated in a school, and have commissioned Mike Bawtree, Head of Computing at the Guildford Royal Grammar School to provide the reviews.

Mike is one of several teachers trying to investigate the *practical* uses of new technology in secondary school education. Having co-operated on a book applying the calculator to O-level and A-level mathematics, he is now considering a similar publication for the PET. "The bulk of educational software", says Mike, "will have to be written by the school that uses the computer – to fit in with their curriculae and approaches to teaching. But there are a few common areas such as simulations, mathematical tools and graphics – they are a tremendous asset on the PET."

His ideal would be a PET on the teacher's desk linked up to a video monitor. Conventional teaching would be interspersed with live computer demonstrations of a technique in action. He has written such programs for Statistical BarCharts, Integration and Differentiation. The general trend towards the quizzes found in the educational sections of most software catalogues, he maintains, is doing more harm than good. "The microcomputer is very limited in this field – it can add up scores, detect whether the right key has been pressed and give 'Timeouts' – but it cannot accept spoken answers, or understand simple English language. This restricts one to Multiple Choice Tests, which is certainly a valid approach, but a very limited one. When non-computer teachers see this kind of thing, it doesn't encourage them to invest in a computer."

The first program reviewed is of this type and hence Mike's comments are not very favourable. We would like to hear from any user with experience in PET educational software – whether or not they agree with the views expressed here. In subsequent issues, Mike will be examining other types of software from various suppliers, and giving his comments again.

Software Review

ENGLISH CHOICE
Marketed by PETSOFT

This package comes with two pages of instructions, some parts of which will probably not mean much to the person unfamiliar with computer jargon.

It is a multiple choice program on English, allegedly for pupils up to and including the fourth year in a secondary school. There are six topics covered in the program.

1. Comprehension of a given text;
2. USA English into British English;
3. Sentence completion with the correct verb;
4. Sentence completion with the correct word;
5. Selection of the mis-spelt word; and,
6. Selecting the single word meaning the same as the given phrase.

It is the opinion of the present writer that far too much has been attempted in a program requiring less than 8K of memory. This program was especially run for members of staff of an English Department including the Head of the Department. All agreed that it would have been better to have taken ONE of the above SIX topics and to have dealt with that exclusively to greater effect.

The program was not deemed easy to use by people with little or no experience of computers nor was it self-explanatory. On one occasion the last 'message' on a screen full of script was "ANY>ABCD". The English equivalent should be used or a different technique for running the program should be employed.

The use made of the screen to lay out the material presented to the user was not highly rated.

Because an attempt has been made to cover so much material in one program the age and ability ranges for which this package is intended are correspondingly wide.

Students asked to evaluate the program thought topic four (in the above list) to be the most interesting of the six. They also expressed the opinion that the program was vague in declaring what it was setting out to achieve.

Petsoft comment that their Multiple Choice programs have since been revised and additional documentation included.

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AUTO This command is followed by a series of optional parameters specifying where you want to enter lines and how far apart you want them. Your PET will automatically respond with a line number prompt. You won't have to enter the line numbers; you won't have to worry about errors of screen editing.

```
AUTO 100,25
  100 FOR I = 1 TO 10
  125 GOSUB 300
  150 ■
```

DELETE Like **LIST**, this command is followed by a range of line numbers . . . and every one of the lines within the range of numbers will be removed instantly from your program. No longer will you have to type a line number, press **RETURN**, type the next line number, **RETURN**, next line. . . .

```
DELETE 200-350

READY.
LIST 200-350

READY.
```

RENUMBER Now you can change all line numbers— and all references to those numbers—instantly, as, for instance by evenly spaced increments of 100 or 25 or 10. . . .

```
LIST

  10 GOSUB 99
  15 PRINT I
  16 GOTO 10
  99 INPUT J
 100 IF J = 0 THEN END
 200 I = SQR(J):RETURN
READY

RENUMBER 100,10

READY.
LIST

 100 GOSUB 130
 110 PRINT I
 120 GOTO 100
 130 INPUT J
 140 IF J = 0 THEN END
 150 I = SQR(J):RETURN
READY.
```

HELP How many times have you wanted to scream "HELP!" when your PET couldn't interpret your program and all it would say was: **?SYNTAX ERROR**? Fret no longer. Now just type in **HELP**. The line on which the error occurs will be shown and the erroneous portion of the line will be indicated in reverse video on the screen. Truly a great help in any learning or school situation.

```
RUN

?DIVISION BY ZERO ERROR IN 500
READY.
HELP
  500 J = SQR(A*B/[●])

READY
```

TRACE Now you can see precisely the order and sequence in which your program is being executed. You can also stop the program at any point and record the sequence. Type in this command and your PET will keep a record of the line numbers of the last six statements executed. These last six statement numbers will appear in a small rectangular window in the upper right hand corner of your screen.

```
TRACE                          #100
                               #110
READY.                         #150
RUN                            #160
                               #175
ENTER YOUR NAME? JIM           #200

HI JIM.

HOW OLD ARE YOU?
```

STEP Again your line numbers are displayed in the upper right hand corner of the screen in this version of **TRACE**. But now your PET executes just one statement and pauses until you press **SHIFT**. Then it proceeds to the next statement.

OFF This command will stop either **TRACE** or **STEP**.

APPEND You've already worked hard to develop a number of programs and, of course, you've saved them on tape. You're working on a program that's now in memory. Just type in **APPEND** "*program name*" and all statements in that program will now follow the program in memory. No need to retype; no opportunity for errors. Save any set of statements or subroutines onto a tape, using the normal **SAVE** command; then recall them with the **APPEND** command and add them permanently to your program.

```
APPEND "INPUT"

PRESS PLAY ON TAPE #1
OK

SEARCHING FOR INPUT
FOUND INPUT
APPENDING

READY.
```

DUMP During or after running a program, this command will display the names and values of all variables used in the execution of your program. You'll know at once what simple variables, arrays and strings you've used and what values you've assigned to each.

```
RUN

READY.
DUMP
A1 =  10
BW = – 6.1
C$ = "HI"
READY.
```

FIND Like **LIST**, this command will show a set of lines. But the FIND command is followed by specifying a character string. Those lines, and only those lines, containing a desired character string will be listed on you PET's screen. If you were to type **FIND A$, 100-500** your PET's screen would display all lines between line numbers 100 and 500 that contain **A$**.

```
FIND A$,100 – 200
  110 A$ = "HELD" + B$
  180 B$ = MID(A$,I,12)
  200 INPUT A$

READY.
```

ACT Petsoft

Radclyffe House, 66-68 Hagley Road,
Edgbaston, Birmingham B16 8PF.
Telephone: 021-455 8585 Telex: 339396

For the new 16K and 32K PETS, the tool kit consists of a single ROM chip which plugs into the left most empty socket inside the PET. Price £55 plus VAT.

For 8K and other 'old ROM' PETS a small printed circuit board is attached to the memory expansion and 2nd cassette ports of the PET. Price £75 plus VAT. Also available for 8K PETS with new ROMS. Please state configuration when ordering.

STACK COMPUTERS ANNOUNCE

KEYPAK© £45 plus VAT

REMOTE PROGRAMMING AID FOR PET COMPUTERS

Stack Computers have developed packages for the old ROM and NEW ROM PETS to enable them to be programmed from external devices.

Once KEYPAK is running Paper Tape Reader:— a listing of a PET basic program can be read in by a reader directly into program area and run without any user contact with the PET.

Transfer Programmes:— a PET or any other microcomputer outputing a PET acceptable basic structure can send its programme to the PET running **KEYPAK.**

Send Programmes by 'phone using an accoustic coupler or modem a PET running **KEYPAK** can receive programmes via the GPO Telephone System.

Telephone Communication and Editing. Ring your collegue and under **KEYPAK** have him edit **your** program on **your** PET screen or show you the correct lines.

KEYPAK is a PET compatible programme supplied on cassette

* Remote **stop key** operation is implemented
* Remote **clear screen** is implemented
* Handles quotes mode

KEYPAK does not handle cursor or screen controls in quotes mode during programme run.

Suitable interfaces and accoustic couplers are available from stock.

STACK COMPUTER SERVICES

290/298 Derby Road, Bootle, Liverpool 20.
051-933 5511